Carcinoma of the Lung Metastatic to Falx Meningioma

Case Report

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Despite the common occurrence of multiple primary tumors, one primary tumor rarely spreads to involve another independent primary tumor.\(^9,12\) In such uncommon instances, the aggressor must possess malignant properties whereas the invaded tumor can be either malignant or benign. The malignant tumor usually metastasizes to a benign tumor, however, rather than to another malignant tumor, a clinical observation lacking satisfactory explanation.\(^3,5,6\)

With the exception of three meningiomas reported as incidental postmortem findings,\(^2,4,7\) the English literature contains only four accounts of extraeranial tumors metastatic to meningiomas.\(^1,7,9,11\) We are reporting a pulmonary adenocarcinoma metastatic to a meningioma of the rostral falx cerebri, which we believe to be a rare biological phenomenon.

**Case Report**

A 39-year-old man was admitted to the University of Kentucky Hospital on December 16, 1964. His illness began with a single generalized seizure 1 month earlier, followed by two generalized seizures on December 14. A lumbar puncture performed at another hospital showed an initial pressure of 340 mm of water and a protein value of 136 mg%. He was transferred to the University of Kentucky Hospital with a tentative diagnosis of brain tumor.

**Examination.** The patient’s general health had been good. He had sustained a head injury 15 years earlier, but the details were not known. For several years the family had noted a gradual change in his personality, although they had always considered his behavior strange. On several occasions in the past few years he had disappeared for days at a time. He remained unmarried and had no close friends.

The patient was tall, lean, and muscular. He loudly denied that he was ill and repeatedly threatened to leave the hospital. He was alert but poorly oriented regarding time and place. His language was abusive and threatening. His gait was grossly ataxic with a wide base, and he swayed to either side. Strength was excellent and, within the limits of his cooperation, sensation was intact. The deep reflexes were symmetrically hyperactive, and both plantar reflexes were extensor. The eye grounds and cranial nerves were normal.

Routine laboratory studies were normal. Chest films showed a nodular density in the right lower lung field. Skull films were normal. A brain scan with Hg\(^{197}\) showed a round midline area of increased uptake involving the medial aspects of both frontal lobes (Fig. 1). Bilateral carotid angiography on December 18 outlined a large bifrontal tumor (Fig. 2). The initial diagnosis was meningioma arising from the falx cerebri and an unrelated pulmonary tumor.

**Operation.** Craniotomy revealed a 6\(\times\)6\(\times\)5 cm tumor between the medial surfaces of both frontal lobes. The tumor was attached to the falx bilaterally, and a thin fringe of tumor covered the dura on both sides of the sagittal sinus. The greater portion of the tumor was on the right side of the falx. The tumor was coarsely nodular and firm, and separated easily from the compressed brain. The mass was reduced in size with the electrosurgical loop. Softened areas within the tumor could be removed by suction. The falx cerebri was incised beneath the superior sagittal sinus and the remaining portion of the attached tumor extracted. Tumor involving both sides of the patent sagittal sinus was coagulated.

The surgical specimen contained multiple fragments of gray-white and yellow tissue having an aggregate weight of approximately 100 gm. Microscopic examination revealed two distinct types of tissue, one an adenocarcinoma and one a meningioma.
Fig. 1. Frontal view (left) and lateral view (right) of brain scans with Hg\textsuperscript{197} showing a circumscribed midline area of increased uptake.

Fig. 2. Lateral view of right carotid arteriogram showing inferior and posterior displacement of the anterior cerebral and its pericallosal and callosomarginal branches. The frontopolar artery is bowed forward.
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FIG. 3. High-power view of cerebral tumor with meningioma on the right and adenocarcinoma on the left. H. & E., X400.

(Fig. 3). The carcinoma had a marked propensity to form glands which contained PAS-positive material. The meningioma was the meningothelial type with numerous psammoma bodies. These findings were interpreted as an adenocarcinoma metastatic to a meningioma.

Postoperative Course. The patient's postoperative course was uneventful except for abusive behavior and urinary incontinence. A collection of cerebrospinal fluid beneath the scalp was treated by lumbar punctures. Bronchoscopy was performed on December 29, and malignant cells were identified in the bronchial washings. A barium enema, intravenous pyelogram, and upper GI study were normal. An increase in the size of the lower lobe density was noted in a chest film taken on January 3.

Second Operation. On January 4, a right thoracotomy was performed through the bed of the unresected sixth rib. The pleural cavity was free of fluid, and a firm, rounded mass was palpated in the lateral basal segment of the lower lobe. The tumor mass, approximately 5 cm in diameter, had caused contraction and dimpling of the overlying visceral pleural surface. Two firm lymph nodes were found in the mediastinum adjacent to the right main-stem bronchus, and several suspicious lymph nodes were palpated in the hilum of the lower lobe. Findings suggested that this was a primary tumor and that local disease could be controlled by resection. Therefore, after excision of the two mediastinal lymph nodes, a right lower lobectomy was performed with removal of hilar lymph nodes.

When the excised right lower lobe was sectioned, a 5-cm irregular, firm, glistening white tumor was found in the lateral basal segment. It appeared to arise from a granular friable area of the segmental bronchus. Bronchial and hilar lymph nodes were replaced by similar firm white tumor. Microscopic examination revealed a tumor which formed glands containing mucin (Fig. 4). In a few areas the tumor grew in sheets, mimicking a squamous cell carcinoma. Bronchial, hilar, and mediastinal lymph nodes contained similar tumor. Bronchial arteries were enlarged.
Postoperative Course. The patient left the hospital in satisfactory condition only to be re-admitted on January 9, 1965, with viral hepatitis. Although still incontinent of urine, he was cooperative and easily managed. His memory was defective, and he was confused as to time and place. A radiographic survey gave no evidence of distant metastatic involvement.

The patient re-entered the hospital on June 5 with complaints of dyspnea and right sciatica. The right chest was opaque, and a skeletal survey disclosed multiple metastatic lesions. Subarachnoid injection of phenol relieved his pain. He died at home on June 17, 1965, 6 months after his original admission to the hospital.

Discussion

Fried,2 Lapresle, et al.,4 and Osterberg (Case 2)7 reported three cases of widely metastatic carcinoma of the breast and lung in which examination after death disclosed asymptomatic meningiomas containing metastatic deposits. Zulch15 and Russell and Rubinstein10 referred to single cases but gave no details.

Osterberg’s first case7 must be accepted with reservation in the absence of proof of an extracranial tumor, either primary or secondary. Clear cells which occur in some meningiomas, notably the angiolastic variety, may be confused with cells of similar appearance in renal carcinomas, and published evidence in Osterberg’s case does not allow clear differentiation between the two.

Störtebecker’s patient (Case 6)11 had undergone surgery for removal of a hypernephroma 3 years before the appearance of focal seizures. Two months following onset of seizures, a convexity meningioma containing metastatic hypernephroma was removed. The patient died of lung metastases 10 months later.

The case reported by Best1 had a large intracerebral metastatic tumor in juxtaposition to a small (3×2×2 cm) and probably asymptomatic meningioma arising from the floor of the middle cranial fossa. The metastatic tumor, a squamous cell carcinoma, probably originated in the lung. The question of whether one hematogenous metastatic focus (temporal lobe or the meningioma) or two separate foci (temporal lobe and menin-
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Our case presented unusual diagnostic and therapeutic considerations. The patient's long history of peculiar behavior supported by angiographic and scintiscan evidence favoring a meningioma of the frontal falk raised the rare possibility of meningioma metastatic to the lung. Although a primary carcinoma of the lung metastatic to the falk could not be discounted, evidence favoring a falk meningioma inclined us toward the diagnosis of two primary tumors.

Carcinomas of the lung, breast, and kidney account for the great majority of all intracranial metastases, and primary tumors at these three sites were responsible for seven of the eight metastatic tumors involving meningiomas. Certain meningiomas must provide a favorable environment for the growth of metastatic tumors, although histologic features of the reported meningiomas have varied, and we have discovered no common denominator. A meningioma may provide an environment for metastatic tumor cells which is either more or less favorable than normal brain. Statistical calculations cannot provide a satisfactory answer\textsuperscript{15,14} but at least suggest that meningioma may be favored over normal brain as a site for secondary tumor deposits.

Summary

We have described the case of a 39-year-old man with a brain tumor who, during the course of study, was also found to have an asymptomatic pulmonary mass. A large meningioma of the falk contained microscopically areas of adenocarcinoma which proved to be primary in the lung. The patient died 6 months later with disseminated carcinoma. We have also reviewed seven previously reported cases of metastatic tumors involving intracranial meningiomas.

References